

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior revisions, and listings, of claims in the application.

Listing of Claims:

1.-106. (Cancelled)

107. (New) A novel combination of additives suitable for use in phosphate ester based aircraft hydraulic fluids comprising;

(a) an acid scavenger in an amount effective to neutralize phosphoric acid and phosphoric acid partial esters formed in situ by hydrolysis of any of the phosphate esters of said base stock wherein said acid scavenger comprises an epoxide compound;

(b) an anti-erosion additive in an amount effective to inhibit flow-induced electrochemical or zeta corrosion of the flow-metering edges of hydraulic servo valves in hydraulic systems wherein said anti-erosion additive comprises an alkali metal salt of a perfluoroalkyl sulfonic acid;

(c) a viscosity index improver in an amount effective to cause the fluid composition to exhibit a viscosity of at least about 3.0 centistokes at about 210° F., at least about 9.0 centistokes at about 100° F., and less than about 4200 centistokes at -65° F., wherein said viscosity index improver comprises a methacrylate ester polymer at least 95% by weight of the polymer having a molecular weight of between about 50,000 and 1,500,000; and

(d) an antioxidant in an amount effective to inhibit oxidation of fluid composition components in the presence of oxidizing agents, wherein said antioxidant is selected from the group consisting of at least one hindered phenol and a combination of at least one hindered phenol and at least one amine compound.

108. (New) An additive composition as set forth in claim 107 wherein the viscosity index improver is present in an amount effective to cause the phosphate ester based hydraulic fluid composition to exhibit a viscosity between about 3 and about 5 centistokes at about 210° F. and between about 9 and about 15 centistokes at 100° F.

109. (New) An additive composition as set forth in claim 107 containing a viscosity index improver in a proportion to provide in said phosphate ester based hydraulic fluid of between about 3% and about 10% by weight of said aircraft hydraulic fluid composition.

110. (New) An additive composition as set forth in claim 107 containing a 2,4,6-trialkylphenol in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.1% and about 1.0% by weight of the aircraft hydraulic fluid composition, a di(alkylphenyl)amine in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.3% and about 1.0% by weight of the aircraft hydraulic fluid composition, and a hindered polyphenol selected from the group consisting of bis(3,5-dialkyl-4-hydroxyaryl)methane and 1,3,5-trialkyl-2,4,6-tris(3,5-di-tert-butyl-4-hydroxyaryl)benzene and mixtures thereof, in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.3% and about 1.0% by weight of the aircraft hydraulic fluid composition.

111. (New) A novel combination of additives suitable for use in phosphate ester based aircraft hydraulic fluids comprising;

- a) a viscosity index improver in a proportion to provide in said phosphate ester based hydraulic fluid of between about 3% and about 10% by weight of the aircraft

hydraulic fluid composition, the viscosity index improver comprising a methacrylate ester polymer, the repeating units of which substantially comprise butyl and hexyl methacrylate, at least 95% by weight of the polymer having a molecular weight of between about 50,000 and about 1,500,000;

(b) an anti-erosion agent in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.02% and about 0.08% by weight of the aircraft hydraulic fluid composition, the anti-erosion agent comprising an alkali metal salt of a perfluoroalkyl sulfonic acid, the alkyl substituent of which is selected from the group consisting of hexyl, heptyl, octyl, nonyl, decyl, and mixtures thereof;

(c) an acid scavenger in a proportion to provide in said phosphate ester based hydraulic fluid of between about 1.5% and about 10% by weight of the aircraft hydraulic fluid composition, the acid scavenger comprising an epoxide compound;

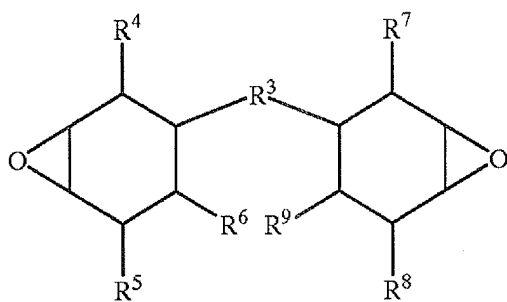
(d) a 2,4,6-trialkylphenol in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.1% and about 1.0% by weight of the aircraft hydraulic fluid composition;

(e) a di(alkylphenyl)amine in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.3% and about 1.0% by weight of the fluid composition; and

(f) a hindered polyphenol selected from the group consisting of bis(3,5-dialkyl-4-hydroxyaryl)methane, 1,3,5-trimethyl-2,4,6-tris(3,5-di-tert-butyl)-4-hydroxyaryl)benzene and mixtures thereof in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.3% and about 1.0% by weight of the aircraft hydraulic fluid composition.

112. (New) A novel combination of additives suitable for use in phosphate ester based aircraft hydraulic fluids comprising;

- (a) a viscosity index improver in a proportion to provide in said phosphate ester based hydraulic fluid of between about 3% and about 10% by weight of the fluid composition, the viscosity index improver comprising a methacrylate ester polymer, the repeating units of which substantially comprise butyl and hexyl methacrylate, at least 95% by weight of the polymer having a molecular weight of between about 50,000 and about 1,500,000;
- (b) an anti-erosion agent in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.02% and about 0.08% by weight of the aircraft hydraulic fluid composition, the anti-erosion agent comprising an alkali metal salt of a perfluoroalkylsulfonic acid, the alkyl substituent of which is selected from the group consisting of hexyl, heptyl, octyl, nonyl, decyl, and mixtures thereof;
- (c) an acid scavenger in a proportion to provide in said phosphate ester based hydraulic fluid of between about 1.5% and about 10% by weight of the aircraft hydraulic fluid composition, the acid scavenger selected from the group consisting of a derivative of a 3,4-epoxy cyclohexane carboxylate and a diepoxide compound corresponding to the formula



wherein R^3 is an organic group containing 1 to 10 carbon atoms, from 0 to 6 oxygen atoms and from 0 to 6 nitrogen atoms, and R^4 through R^9 are independently selected from among hydrogen and aliphatic groups containing 1 to 5 carbon atoms, and mixtures of the 3,4-epoxycyclohexane carboxylate and the diepoxide compound;

- (d) 2,4,6-trialkylphenol in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.1% and about 1.0% by weight of composition;
- (e) a di(alkylphenyl)amine in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.3% and about 1.0% by weight of the aircraft hydraulic fluid composition; and
- (f) a hindered polyphenol selected from the group consisting of bis(3,5-dialkyl-4-hydroxyaryl)methane, 1,3,5-trimethyl-2,4,6-tris(3,5-di-tert-butyl-4-hydroxyaryl)benzene, and mixtures thereof in a proportion to provide in said phosphate ester based hydraulic fluid of between about 0.3% and about 1.0% by weight of the aircraft hydraulic fluid composition.

113. (New) An additive composition as set forth in claim 112 further comprising benzotriazole or a benzotriazole derivative in a proportion to provide in said phosphate ester

based hydraulic fluid of between about .0005% and about 0.09% of the aircraft hydraulic fluid composition as a copper corrosion inhibitor.

114. (New) An additive composition as set forth in claim 112 further comprising in proportion to provide in said phosphate ester based hydraulic fluid between about 0.0035% and about 0.010% by weight of the aircraft hydraulic fluid composition of an alkali metal arenate.

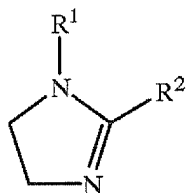
115. (New) A novel combination of additives suitable for use in phosphate ester based aircraft hydraulic fluids comprising;

- (a) an acid scavenger in an amount effective to neutralize phosphoric acid and phosphoric acid partial esters formed in situ by hydrolysis of any of the phosphate esters of the base stock wherein said acid scavenger comprises an epoxide compound;
- (b) an anti-erosion additive in an amount effective to inhibit flow-induced electrochemical or zeta corrosion of the flow-metering edges of hydraulic servo valves in hydraulic systems. wherein said anti-erosion additive comprises an alkali metal salt of a perfluoroalkyl sulfonic acid;
- (c) a viscosity index improver in an amount effective to cause the fluid composition to exhibit a viscosity of at least about 3.0 centistokes at about 210.degree. F., at least about 9.0 centistokes at about 100.degree. F., and less than about 4200 centistokes at -65.degree. F..Iadd., wherein said viscosity index improver comprises a methacrylate ester polymer at least 95% by weight of the polymer having a molecular weight of between about 50,000 and 1,500,000;

(d) an antioxidant in an amount effective to inhibit oxidation of fluid composition components in the presence of oxidizing agents, wherein said antioxidant is selected from the group consisting of at least one hindered phenol and a combination of at least one hindered phenol and at least one amine compound; and

(e) a 4,5-dihydroimidazole compound in an amount effective to increase the stability of said phosphate ester based hydraulic fluid composition by at least 25% at 300.degree.

F. as measured by epoxide depletion, the 4,5-dihydroimidazole compound corresponding to the formula



wherein R¹. is selected from the group consisting of hydrogen, alkyl, alkenyl, hydroxyalkyl, hydroxyalkenyl, alkoxyalkyl and alkoxyalkenyl, and R². is selected from the group consisting of alkyl, alkenyl and aliphatic carboxylate.

116. (New) An additive composition as set forth in claim 115 wherein R¹ is hydrogen or lower alkyl and R². is a fatty acid residue.

117. (New) An additive composition as set forth in claim 115 wherein R¹ is hydroxyalkyl and R² is alkenyl.

118. (New) An additive composition as set forth in claim 115 wherein the 4,5-

dihydroimidazole is selected from the group consisting of 2-(8-heptadecenyl)-4,5-dihydro-1H-imidazole-1-ethanol and the condensation product of a C₁₄ to C₁₈ fatty acid and 4,5-dihydro-1H-imidazole.

119. (New) An additive composition as set forth in claim 118 wherein the 4,5-dihydroimidazole compound is the condensation product of a C₁₆ to C₁₈ fatty acid and 4,5-dihydro-1H-imidazole.

120. (New) An additive composition as set forth in claim 115 wherein the hindered phenol antioxidant comprises a mixture of a hindered phenol and a hindered polyphenol.

121. (New) An additive composition as set forth in claim 120 wherein the hindered polyphenol comprises a compound selected from the group consisting of bis(3,5-dialkyl-4-hydroxyaryl)methane, 1,3,5-trialkyl-2,4,6-tris(3,5-di-tert-butyl-4-hydroxyaryl)benzene, and mixtures thereof.

122. (New) An additive composition as set forth in claim 115 wherein the antioxidant amine compound is a diarylamine.

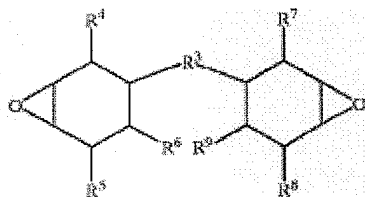
123. (New) An composition as set forth in claim 122 wherein said diarylamine comprises di(p-octylphenyl)amine.

124. (New) A composition as set forth in claim 122 further comprising up to about 1.0% by weight of 2,6-di-tertiary-butyl p-cresol.

125. (New) A composition as set forth in claim 107 wherein the hindered phenol antioxidant comprises a mixture of a hindered phenol and a hindered polyphenol.

126. (New) A composition as set forth in claim 125 wherein the amine antioxidant is a diaryl amine.

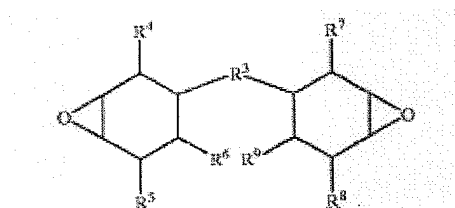
127. (New) A composition as a set forth in claim 107 wherein said epoxide acid scavenger is selected from the group consisting of a derivative of a 3,4-epoxy cyclohexane carboxylate and a diepoxide compound corresponding to the formula



wherein R^3 is an organic group containing 1 to 10 carbon atoms, from 0 to 6 oxygen atoms and from 0 to 6 nitrogen atoms, and R^4 through R^9 are independently selected from among hydrogen and aliphatic groups containing 1 to 5 carbon atoms, and mixtures of the 3,4-epoxycyclohexane carboxylate and the diepoxide compound.

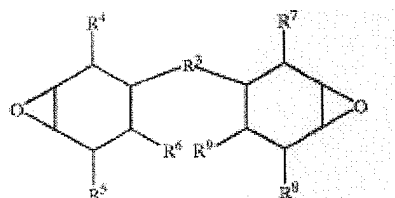
128. (New) A fluid composition as set forth in claim 111 wherein said epoxide acid scavenger

is selected from the group consisting of a derivative of a 3,4-epoxy cyclohexane carboxylate and a diepoxide compound corresponding to the formula



wherein R^3 is an organic group containing 1 to 10 carbon atoms, from 0 to 6 oxygen atoms and from 0 to 6 nitrogen atoms, and R^4 through R^9 are independently selected from among hydrogen and aliphatic groups containing 1 to 5 carbon atoms, and mixtures of the 3,4-epoxycyclohexane carboxylate and the diepoxide compound.

129. (New) A composition as set forth in claim 115 wherein said epoxide acid scavenger is selected from the group consisting of a derivative of a 3,4-epoxy cyclohexane carboxylate and a diepoxide compound corresponding to the formula



wherein R^3 is an organic group containing 1 to 10 carbon atoms, from 0 to 6 oxygen atoms and from 0 to 6 nitrogen atoms, and R^4 through R^9 are independently selected from among hydrogen

Application of: Gerbrand Deetman
Serial No.: 09/801,883
Preliminary Amendment

and aliphatic groups containing 1 to 5 carbon atoms, and mixtures of the 3,4-epoxycyclohexane carboxylate and the diepoxide compound.

130. (New) A composition as set forth in of claims 107 and 115, wherein in the anti-erosion additive comprising an alkali metal salt of a perfluoroalkyl sulfonic acid the alkyl substituent comprises from 5 to 12 carbon atoms.